

IN THE DRAWINGS

Applicants enclose a mark up of Figure 7 to replace the mark up of Figure 7 sent in the previous amendment. Applicants have not sent the replacement sheet of Figure 7 because it is correct and sent in the previous amendment. The specification supports this correction at paragraph no. 0041.

REMARKS

This is an amendment in response to the Office action dated May 26, 2006. Applicants appreciate the grant of the interview on June 9, 2006. Applicants amend claims 5, 22, 25, 28, 29, and 30. Claims 1-32 are presented for examination. Applicants request reexamination and reconsideration of the application.

In paragraph nos. 1-3 of the Office action, the Examiner gives status of claims 1-32, withdraws the finality of the previous Office action based on the RCE and submission (i.e., the amendment) filed on April 10, 2006, and states the amendment necessitated new grounds of rejections.

In paragraph no. 4, the Examiner objects to claim 25 as having informality and proposes a change to overcome the objection. Applicants submit amended claim 25 overcomes the objection since it adopts Examiner's proposal.

In paragraph nos. 5-6, the Examiner rejects claims 1-5 under 35 USC 112, first paragraph, as not complying with the written description and enablement requirements. The Examiner asserts the specification does not convey how an original data element of a first and second snapshot could be stored at the *same address* of a target VLUN while both first and second snapshots persist *concurrently*. The Examiner asserts if the original data element of both snapshots is at the same address, both snapshots cannot coexist, as one must be overwritten.

Claims 1-5 meet the written description and enablement requirements. Figure 8 shows an original data element B_0 of a first and second snapshot stored at the *same address* of a target VLUN while the first and second snapshots persist *concurrently*. The metadata shown in Figure 8, namely, the first bitmap and the first log file for the first snapshot and the second bitmap and the second log file for the second snapshot demonstrate that the first snapshot and second snapshot persist concurrently. Also Figure 8 shows the first log file and the second log file each contain a target pointer to the original data element B_0 at the same address of the target VLUN. Thus claims 1-5 satisfy the written description and enablement requirements.

1 In paragraph no. 7, the Examiner rejects claims 22-24 and 28-32 under 35 USC 112,
2 second paragraph, as being indefinite. Specifically, the Examiner states claims 22-24
3 and 30-32 need an antecedent basis for "the original data" and claims 28-29 need an
4 antecedent basis for "the first snapshot data."

5 Applicants strike "the" in the first recitation of the phrase "the original data" in claim 22
6 and in claim 30 to provide an antecedent basis. Claims 22-24 and 30-32 comply with 35
7 USC 112. Similarly, applicants amend claims 28-29 to provide an antecedent basis for
8 "the first snapshot data." Claims 28-29 comply with 35 USC 112.

9
10 In paragraph no. 8, the Examiner rejects claim 1, 2, 4, 6, 7, 12, 17, and 19 under 35
11 USC 103(a) as being unpatentable over US Patent No. 6,434,681 B1 to Armangau
12 (Armangau), in view of US Published Application No. 2004/0024961 A1 to Cochran
13 (Cochran), and further in view of US Published Application No. 2003/0131278 A1 to
14 Fujibayashi (Fujibayashi).

15 The Examiner concedes Armangau fails to disclose first and second metadata locating
16 an original data element of the first snapshot data and of the second snapshot data at
17 the same address in the target VLUN as recited in claim 1, but argues Figures 10A-10H
18 of Cochran show this missing feature.

19 Cochran fails to support the rejections, because:
20

21 1) Cochran fails to describe a snapshot operation or even mention the term
22 snapshot in connection with Figures 10A-10H.

23 2) Cochran states Figures 10A-10H illustrate a full-LUN-copy operation.
24

25 3) A full-LUN-copy operation involves copying (not a snapshot) of each
26 sector within a primary LUN to the copy LUN (Cochran paragraph 0013).

27 4) Cochran never suggests copying each data element from the primary LUN
28 to the copy LUN in Figures 10A-10H is a snapshot copy of each data element.
29
30

1 5) The last Office action's position that copying each data element is a
2 snapshot is not consistent with Cochran's definition of a snapshot. Cochran says a
3 snapshot copy is a virtual copy of the primary LUN implemented as a combination of the
4 primary LUN, the meta-data map, and the delta-data LUN (Cochran paragraph 0014).
5 The meta-data map indicates the location of all of the data of the primary LUN at the
6 time of the snapshot: in the primary LUN or the delta-data LUN. Thus, a snapshot is an
7 image of all the data of the primary LUN at an instant in time.

8 6) The last Office action's position is also inconsistent with our definition of a
9 snapshot. Our specification states a snapshot preserves an image of the original data
10 present in the source VLUN at the time of the snapshot (our published paragraphs 0032
11 - 0034).

12 7) Cochran draws a sharp distinction between a full copy operation and a
13 snapshot operation and the Office asserting the full-LUN-copy operation shown in
14 Figures 10A-10H involves a "snapshot" of each data element blurs this distinction and is
15 inconsistent with Cochran's definition of a snapshot copy.
16

17 8) Once we understand Cochran's definition of a snapshot, it is clear
18 Cochran fails to disclose a second snapshot much less claim 1 in Figures 10A-10H.

19 9) Fujibayashi fails to teach or suggest claim 1 or make up for the deficiency
20 of Armangau and Cochran because, among other things, it fails to disclose first and
21 second metadata that locate an original data element of first snapshot data and second
22 snapshot data at the same address of the target VLUN.
23

24 Claim 1 captures the differences and would have been nonobvious over Armangau,
25 Cochran, and Fujibayashi, since claim 1 requires a method of snapshot operation for a
26 data storage system with a first host that communicates with a cache memory, a source
27 Virtual Logical Unit Number (VLUN) containing source data and a target VLUN,
28 preserving first snapshot data of the source data at an instant in time and second
29 snapshot data of the source data at a later instant in time, wherein the first and second
30 snapshots persist concurrently, comprising:

1 generating first metadata to locate the first snapshot data and to indicate when a
2 data element of the first snapshot data is in the target VLUN; and

3 generating second metadata to locate the second snapshot data and to indicate
4 when a data element of the second snapshot data is in the target VLUN, wherein the
5 first and second metadata locate an original data element of the first snapshot data and
6 of the second snapshot data at the same address of the target VLUN.

7
8 Armangau, Cochran, and Fujibayashi do not teach the subject matter of claim 1. Thus,
9 claim 1 and its dependent claims 2 and 4 are allowable.

10 Claim 6 and its dependent claims 7 and 12 distinguish over Armangau, Cochran, and
11 Fujibayashi because all fail to teach or suggest as recited in claim 6 a snapshot system
12 for a data storage system including a first host that communicates with a cache
13 memory, a source Virtual Logical Unit Number (VLUN), a target VLUN, and metadata,
14 comprising:

15 a source VLUN for active data;

16
17 a target VLUN to store migrated snapshot data;

18 first metadata to indicate when and to locate where the first snapshot of the
19 active data is in the target VLUN; and
20

21 second metadata to indicate when and to locate where second snapshot data of
22 the active data is in the target VLUN wherein the first metadata and the second
23 metadata indicate and locate a data element common to the first and second snapshot
24 data in the target VLUN, wherein the snapshot system preserves the active data of the
25 first snapshot while taking the second snapshot.

26 Claim 17 and its dependent claim 19 distinguish over Armangau, Cochran, and
27 Fujibayashi because they all fail to teach or suggest as recited in claim 17 a method of
28 snapshot operation in a data storage system in a first host that communicates with a
29 cache memory, a source Virtual Logical Unit Number (VLUN), a target VLUN, first
30 metadata, and second metadata, comprising:

1 receiving requests from an application to modify data in the cache memory;

2 writing the modified data to the cache memory;

3
4 destaging the original data to the target VLUN to preserve the original data of a
5 first snapshot and a second snapshot; and

6 updating the first and second metadata to locate the original data common to the
7 first and second snapshot in the target VLUN.

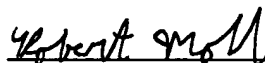
8
9 In paragraph no. 9, the Examiner states claims 14-16 and 26-27 are allowed.

10 In paragraph nos. 10-12, the Examiner states claims 8-11, 13, 18, and 20-21 are
11 objected to as being dependent on a rejected base claim, but would be allowable if
12 rewritten in independent form, and claim 22, 25, and 28-32 allowed if rewritten to
13 overcome the rejections set forth in sections 4 and 7, respectively. Because the rejected
14 base claims are allowable applicants do not rewrite the claims.

15 In paragraph nos. 13-16, the Examiner states the amendment to claim 1 made some
16 arguments moot, he considered applicants' arguments and discusses Cochran with
17 respect to claims 6 and 17. Applicants submit the earlier remarks address this
18 discussion.

19
20 Please email reply if you have any question, comment, or it will expedite prosecution.

21 Respectfully Submitted,

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23 _____

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